Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method for forming an opening in a carbon free low-k dielectric layer using DUV photolithography comprising:

(a) providing a silicon wafer having a conductive wiring element over an insulative layer;

(b) forming a low-k dielectric layer over said conductive wiring element;

(c) depositing a carbon deficient silicon oxycarbide ARL over said low-k dielectric layer whereby carbon deficiency is accomplished by introducing hydrogen during said depositing thereby establishing a quantity of Si-H bonding in place of Si-C bonding in said ARL, wherein said carbon deficient silicon oxycarbide ARL contains less than about 10 atomic % carbon;

(d) patterning a DUV photoresist layer over said ARL to define said opening;

(e) etching said ARL in said opening thereby exposing said low-k dielectric layer; and

(f) etching said exposed low-k dielectric layer, thereby exposing said conductive wiring element in said opening.

2. (Original) The method of claim 1 wherein said low-k dielectric layer is a spin-on glass, a siloxane, an aerogel, a hydrosilsesquioxane or a xerogel.

3. (Original) The method of claim 1 wherein an etch stop layer is deposited between said conductive wiring element and said low-k dielectric layer.

4. (Original) The method of claim 3 wherein said etch stop layer is silicon nitride, silicon oxynitride, or aluminum oxide.

5. (Original) The method of claim 1 wherein said carbon deficient silicon oxycarbide ARL is deposited by PECVD at a substrate temperature of between about 100 and and 400°C in an ambient containing SiH_4 at a flow rate of between about 10 and 10,000 SCCM, CO_2 at a flow rate of between about 10 and 10,000 SCCM, hydrogen at a flow rate of between about 10 and 10,000 SCCM, and a helium carrier gas flowing at a rate of between about 0 and 10,000 SCCM adjusted to maintain a chamber pressure of between about 1 mTorr and 100 Torr.

6. (Currently amended) The method of claim 5 wherein said carbon deficient silicon oxycarbide ARL contains ~~less than about 10 atomic %, and, more preferably,~~ less than about 5 atomic %[[.]] Carbon.

7. (Original) The method of claim 5 wherein said carbon deficient silicon oxycarbide ARL contains greater than about 20 atomic % oxygen.

8. (Original) The method of claim 1 wherein the Si-C/Si-O bond ratio of said carbon deficient silicon oxycarbide ARL is less than about 18%.

9. (Original) The method of claim 1 wherein said etching of said exposed low-k dielectric layer is accomplished by high density plasma etching in a plasma containing a fluorocarbon in a carrier gas of helium.

10. (Original) The method of claim 1 wherein said opening is a contact opening or a via opening.

11. (Original) A method for forming an opening in a carbon containing low-k dielectric layer using DUV photolithography comprising:

(a) providing a silicon wafer having a conductive wiring element over an insulative layer;

(b) forming a carbon containing low-k dielectric layer over said conductive wiring element;

(c) depositing a carbon deficient silicon oxycarbide ARL over said carbon containing low-k dielectric layer whereby carbon deficiency is accomplished by introducing hydrogen during said depositing thereby establishing a quantity of Si-H bonding in place of Si-C bonding in said ARL;

(d) patterning a DUV photoresist layer over said ARL to define said opening;

(e) etching said ARL in said opening thereby exposing said carbon containing low-k dielectric layer; and

(f) etching said exposed carbon containing low-k dielectric layer in at least the occasional presence of hydrogen, thereby exposing said conductive wiring element in said opening.

12. (Original) The method of claim 11 wherein said carbon containing low-k dielectric layer is an aryl polysilsesquioxane, an alkyl polysissesquioxane, or an organosilicate glass.

13. (Original) The method of claim 11 wherein an etch stop layer is deposited between said conductive wiring element and said low-k dielectric layer.

14. (Original) The method of claim 13 wherein said etch stop layer is silicon nitride, silicon oxynitride, or aluminum oxide.

15. (Original) The method of claim 11 wherein said carbon deficient silicon oxycarbide ARL is deposited by PECVD at a substrate temperature of between about 100 and 400°C in an ambient containing SiH_4 at a flow rate of between about 10 and 10,000 SCCM, CO_2 at a flow rate of between about 10 and 10,000 SCCM, hydrogen at a flow rate of between about 10 and 10,000 SCCM, and a helium carrier gas flowing at a rate of between about 0 and 10,000 SCCM adjusted to maintain a chamber pressure of between about 1 mTorr and 100 Torr.

16. (Original) The method of claim 15 wherein said carbon deficient silicon oxycarbide ARL contains less than about 10 atomic %, and, more preferably, less than about 5 atomic %. Carbon.

17 (Original) The method of claim 15 wherein said carbon deficient silicon oxycarbide ARL contains greater than about 20 atomic % oxygen.

18. (Original) The method of claim 11 wherein the Si-C/Si-O bond ratio of said carbon deficient silicon oxycarbide ARL is less than about 18%.

19. (Original) The method of claim 11 wherein said etching of said exposed carbon containing low-k dielectric layer is accomplished by high density plasma etching in a plasma containing a fluorocarbon and hydrogen.

20. (Original) The method of claim 19 wherein said hydrogen is present in said plasma during the entire said etching of said exposed carbon containing low-k dielectric layer.

21. (Original) The method of claim 19 wherein said hydrogen is intermittently present in said plasma during said etching of said exposed carbon containing low-k dielectric layer.

22. (Original) The method of claim 11 wherein said opening is a contact opening or a via opening.